INTERNATIONAL BACCALAUREATE
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MARKSCHEME

May 2000

ENVIRONMENTAL SYSTEMS

Standard Level

Paper 2

10 pages

SECTION A

1. (a) (i) A group of populations living and interacting with each other in a common habitat *(or any reasonable alternative)*. ***[1]***

(ii) Ecosystem E/mature tropical rain forest ***[1]***
Reason: any of
climax community/higher habitat diversity/higher production base
(or any reasonable alternative). ***[1]***

(b) *Any three of:* solar radiation or light/ precipitation or water/ temperature/ pH/ soil type/ climate. *(But do not allow climate and either precipitation or temperature or both for the mark.)* ***[1]***

(c) (i) 15 200 ***[1]***

(ii) $\frac{14\,400}{24\,400} \times 100 = 59\ \%$
correct answer ***[1]***; correct working ***[1]*** ***[2]***

(iii) It is not a climax community ***[1]***/ is a crop in a managed system ***[1]***;
has high inputs of fertiliser ***[1]***/
and pesticides to eliminate food chains ***[1]***/
energy subsidy ***[1]*** ***[2]***

(iv) high rate of respiration as temperature is high…***[1]***/
…. Production is lost in respiratory losses ***[1]***;
All NPP is used in HR ***[1]***
or reasonable alternative explanation. ***[2]***

(d) (i) Increase in CFCs leads to loss of ozone layer ***[1]***;
more UV radiation damage to producers ***[1]***;
less photosynthesis so less GPP ***[1]*** ***[3]***

(ii) Acid deposition reduces tree growth ***[1]***/
trees die back ***[1]***;
Al ions cause brittle stems ***[1]***;
increasing acidity of soil reduces NPP ***[1]***. ***[3]***

(iii) Global warming ***[1]***;
as increased CO_2 levels in atmosphere ***[1]***;
as reduced sink for carbon ***[1]*** ***[3]***

Total [20 marks]

SECTION B

General Essay Markscheme
Each essay is marked out of 20 of which 3 are for expression and development of ideas (EDI).

0	No expression of relevant ideas.
1	Expression and development of relevant ideas is limited.
2	Ideas are relevant, satisfactorily expressed and reasonably well developed.
3	Ideas are relevant, very well expressed and well developed.

2. (a) Define natural capital = resources that produce natural income ***[1]***;
increase in population puts more pressure on natural capital ***[1]***;
if this is not used sustainably, natural income is reduced or lost ***[1]***;
as India becomes more industrialised, it uses more natural capital and income ***[1]***;
more people need more goods and services and as living standards improve, more is required ***[1]***;
pricing of natural capital is only in terms of economics – conflicting values ***[1]***.
or appropriate arguments. ***[6]***

(b) *(Award **[1 mark]** for reasons and **[1 mark]** for discussion × 4).*
For example – educated women are more productive ***[1]***;
Discussion ***[1]***/ *e.g.* data from 70 developing countries suggest that increasing girls' secondary schooling from 4 to 16 % would increase the women's labour force by over 12 %. ***[1]/***

– educated women are more confident ***[1]***;
Discussion *e.g.* studies from India found literate women expected and received better treatment at clinics and hospitals. Research in Bangladesh found educated women communicated more with their husbands and have a greater say in family decisions than uneducated women. ***[1]/***

– educated women use family planning ***[1]***;
Discussion *e.g.* it has been estimated that giving 1000 girls an extra year of education would avoid up to 500 births. ***[1]***/

– educated women have healthier children ***[1]***;
Discussion *e.g.* the mother is usually responsible for her family's health. Data from 33 less-developed countries reveals that every additional year of a mother's schooling is associated with an additional 7 to 9 % drop in child mortality. ***[1]***
or appropriate reasons and discussion ***[2]***.

(Expect to give credit for a variety of relevant responses.) ***[8]***

continued…

Question 2 continued

(c) *(Award marks for detailed discussion of a named policy or appropriate discussions of several policies)*.
For example, Indian policy of enforced sterilisation probably had little effect on birth rate ***[1]***/ transistor radios and compulsion failed in India ***[1]***/but decreased rates of infant mortality due to better education and health care can reduce growth rate ***[1]***;
free contraception can reduce growth rate ***[1]***/
In China the one child policy has led to female infanticide ***[1]***/ ***[3]***

Expression of ideas ***max [3 marks]***

Total [20 marks]

3. (a) *(Names of bacteria are not required to gain full marks*).

Biotic = living, so bacteria, fungi, plants and animals ***[1]***;
N fixation by bacteria with nitrogenase enzyme either free-living (90 %) (*Azotobacter*, *Nostoc*) or *Rhizobium* (symbiotic with roots of legumes) – fix atmospheric nitrogen to ammonium ions ***[1]***;
Nitrification by bacteria if oxygen present:
ammonium ions (*Nitrosomonas*) to nitrite (*Nitrobacter*) to nitrate ***[1]***;
Plants take up N as ammonium and nitrate ions ***[1]***;
convert to proteins which make up the structure of the cell ***[1]***;
Plants eaten by animals and amino acids rearranged to form other proteins ***[1]***;
Putrefaction/decomposition – breakdown of dead organisms by bacteria and fungi of nitrogen compounds back to ammonium ions ***[1]***;
Denitrification – (*Pseudomonas denitrificans*) converts nitrate to nitrogen ***[1]***;
biotic phases store N briefly ***[1]***;
Excretion by organisms ***[1]***. ***[7]***

Candidates may include human processes here instead of in part (c).
(Award marks if valid points but obviously do not award twice.)

(b) energy drives the cycle of materials ***[1]***;
is driven by energy ultimately from solar radiation ***[1]***;
and lightning ***[1]***/
human input of energy from the Haber process and fertiliser manufacture ***[1]***. ***[3]***

(c) large scale use of ammonia fertilisers converts nitrogen gas to ammonia – alters balance ***[1]***;
use of excess fertiliser on land leads to leaching loss – contamination of water supplies and eutrophication ***[1]***;
nitrogen oxides from car exhausts – released from fossil fuels ***[1]***;
nitrogen oxides contribute to acid deposition – affects food chains ***[1]*** and solubility of other minerals by change of pH ***[1]***;
high N levels increase NPP at first ***[1]***;
alter balance of ecosystems ***[1]***;
ammonia from animal urine ***[1]***;
increase in food production ***[1]***;
human activity speeds up the cycle ***[1]*** ***[7]***
Expression of ideas ***max [3 marks]***

Total [20 marks]

4. (a) C emissions increase carbon dioxide in the atmosphere which is a Greenhouse gas and leads to global warming ***[2]***;
C emissions are from industry, transport and power stations ***[1]***;
US has highest emissions by far – nearly double China ***[1]***;
size of C emissions not related to size of population but to development ***[2]***;
US also has most emissions *per capita* ***[1]***;
as do other developed countries ***[1]***;
Four of top ten are in Europe ***[1]***. ***[8]***

(b) *Agreements award up to* ***[4 marks]*** *but must have specific agreements. The material below is for information.* 1990, Geneva: scientists on Intergovernmental Panel on Climate Change say 60 % reduction in current carbon dioxide levels required. ***[1]***;

1992, Rio de Janeiro Earth Summit: politicians from 150 countries sign Climate Change Convention. Its purpose is to slow down climate change to a level at which people and ecosystems will be able to adapt. Politicians cannot agree on any cuts; instead industrialised countries agree to keep carbon dioxide levels down to 1990 levels by year 2000. Developing countries make no commitments. ***[1]***;

March 1995, Berlin: politicians hold climate summit. Agree that measures previously agreed to meet the Convention's goals are inadequate, but defer action on cutting emissions. Agree that legally binding reduction targets for the early 21st century should be ready for signing by industrialised countries by 1997. There are to be no commitments for the developing world. ***[1]***;

December 1995, Rome: scientists complete Intergovernmental Panel on Climate Change second report. Agree for the first time that humans are discernibly altering the climate. Again warn that 50 to 70 % cuts in Greenhouse gases are required. ***[1]***;

October 1996, Paris: International Energy Agency says the great majority of developed countries will fail to keep Rio Earth Summit promises to stabilise carbon dioxide emissions. ***[1]***;

December 1997, signing of Kyoto Protocol: make or break meeting for Rio's Climate Change Convention. New agreement needed to reduce greenhouse gas emissions from year 2000. ***[1]***;

2001: Intergovernmental Panel on Climate Change will report on the latest state of science. By then climate change is expected to be well established and measurable.

2020: if by this date the whole world is not locked into an agreement to combat climate change, the Intergovernmental Panel on Climate Change say a series of catastrophes loom. ***[4]***

(c) Any that reduce burning of fossil fuels ***[1]***;
technology: renewable energy sources for transport ***[1]*** and electricity generation ***[1]***/*e.g.* solar HEP ***[1]***;

policy: laws to clean car engines – catalytic converters/lean burn ***[1]***/ reduce car use ***[1]***/improve public transport ***[1]***/ energy tax ***[1]*** ***[5]***

Expression of ideas ***max [3 marks]***

Total [20 marks]